

the first PTC element; and (ii) the first electrode disposed on the second substrate is also disposed on the second surface of the first PTC element and extends to the second end of the first PTC element but not the first end of the first PTC element;

the second PTC element positioned between the second and third supporting substrates such that: (i) the second electrode disposed on the second substrate is also disposed on the first surface of the second PTC element and extends to the first end of the second PTC element but not the second end of the second PTC element; and (ii) the electrode disposed on the third substrate is also disposed on the second surface of the second PTC element and extends to the second end of the second PTC element but not the first end of the second PTC element;

a first conductive end termination wrapping around a first end of the device; and
a second conductive end termination wrapping around a second end of the device.

18. (Amended) The electrical device of Claim 16 wherein the first, second and third substrates are formed from a material selected from the group consisting of ceramic, FR-4 epoxy, glass, and melamine.

REMARKS

This is a reply to the Final Office Action mailed August 13, 2001 with a shortened three month response period. Claims 1-5, 7, 8, 10-16, and 18-42 were pending in the application. Claims 33-37 were withdrawn from consideration.

In the August 13, 2001 final Office Action, Claims 26-32 and 38-42 were allowed. Claims 1-5 and 10-15 were rejected under 35 U.S.C. § 102(a) as being anticipated by Kojima et al. (WO98/29879). Claims 7 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Kojima in view of McGuire et al. Claims 1-5, 8, 10 and 13 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Yoneda in view of Niihara (JP 6-69416). Claims 16, 18-19 and 23-25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sunahara (JP 4-150001) in view of Hiihara. And Claims 20-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sunahara with Niihara further in view of McGuire et al.

Applicants appreciate the courtesies extended by Examiner Easthom during the telephonic interview on June 27, 2001. By way of this Reply, Applicants have amended Claims 1, 8, 16, and 18. Accordingly, Claims 1-5, 7, 8, 10-16, 18-32 and 38-42 are now at issue.

Section 102(a) Rejection of Claims 1-5 and 10-15 As Being Anticipated by Kojima

Claim 1 of the present application covers an electrical circuit protection device. The device includes a first and second electrically insulating substrate, a polymeric PTC element, and first and second conductive end terminations. Electrodes are disposed on the supporting substrates and connect the end terminations to the PTC element.

Claim 1 has been amended to clarify the structural relationship between the substrates, electrodes and PTC element. Each substrate has only one electrode disposed on it. The electrode disposed on the first substrate is also disposed on the first surface of the PTC element, and is the only electrode disposed on the first surface of the PTC element. The electrode disposed on the second substrate is also disposed on the second surface of the PTC element, and is the only electrode disposed on the second surface of the PTC element.

This claimed structure is different than the device disclosed in Figs. 1A and 1B of Kojima. The device disclosed in Kojima has two electrodes 13a, a remote distal portion not numbered disposed on the first surface of the PTC element 11a, and two electrodes 13b. A remote distal portion not numbered is disposed on the second surface of the PTC element 11c.

Indeed, each embodiment disclosed in Kojima has the outer electrodes divided into two parts (See Figs. 1A, 1B, 5A, 5B, 9). Accordingly, because Kojima does not disclose each and every element of amended Claim 1, Applicants respectfully submit that Claim 1 is patentable over Kojima.

Claims 2-5 and 10-15 depend from Claim 1 and necessarily include each limitation of Claim 1. Thus, for the same reason Claim 1 is patentable over Kojima. Claims 2-5 and 10-15 are also patentable.

Section 103(a) Rejection of Claims 1-5, 8, 10 and 13 Over Yoneda in View of Niihara

Applicants respectfully submit that the Examiner has not set forth a *prima facie* case of obviousness with respect to the Section 103(a) rejection of Claims 1-5, 8, 10 and 13. Specifically, the ceramic thermistor elements of the Yoneda devices could not be modified simply by employing a polymer PTC element, as disclosed in Niihara, because it would destroy the intended function of the Yoneda device. First, every embodiment of the Yoneda device is "enclosed in an envelope" consisting of an insulative ceramic material such as alumina or zirconia (Yoneda, col. 4, lines 34-35). This insulative envelope would not permit a polymer PTC

element to expand as necessary during overcurrent situations. In other words, because the material would not be permitted to freely expand, and break the chain of conductive particles dispersed in the polymer, the material would not reach the necessary high resistance state. Such a device would fail to operate as a circuit protection device. Moreover, the layers of the ceramic thermistor disclosed in Yoneda are fired and/or sintered at temperatures well beyond the melting point temperature of any polymers suitable for use as a PTC element (e.g., 1000°C and 1700°C; Yoneda, col. 5, lines 21-25). Thus, the only method of manufacturing the device disclosed in Yoneda could no longer be employed.

In addition, one of ordinary skill in the art would not have found it obvious to modify the electrode configuration of the device disclosed in Fig. 6 of Yoneda, in view of the device disclosed in Fig. 9 of Yoneda, to come up with the claimed invention. Such a modification teaches away from the claimed invention because the electrodes in Fig. 9 of Yoneda are completely embedded in the thermistor element. Instead, the claimed device of the present invention has electrodes which are disposed on one surface of the supporting substrate and the other disposed on the surface of the PTC element. Accordingly, Applicants respectfully submit that one of ordinary skill in the art would not have found it obvious to combine and/or modify the embodiments disclosed in Yoneda with the teachings of Niihara.

Even if such a combination or modification were obvious, Applicants respectfully submit that the combination of Yoneda in view of Niihara does not render Claims 1-5, 8, 10 and 13 obvious because such a combination does not disclose each and every element of the rejected claims. Particularly, the combination of Yoneda and Niihara does not result in a device having a first electrode disposed on a first supporting substrate *and* disposed on the first surface of the PTC element *and* extending to the first end of the PTC element but not the second end. Likewise, the combination of Yoneda and Niihara does not result in a device having a second electrode with this same configuration/relationship with the second supporting substrate and the PTC element.

Instead, Fig. 9 of Yoneda and the device disclosed in Niihara illustrate devices with electrodes embedded entirely in the PTC element. Therefore, the electrodes are not disposed on the surface of the PTC element and the surface of the supporting substrates like the claimed invention. Further, the device disclosed in Fig. 6 of Yoneda does not disclose electrodes which extend to one end of the PTC element, but not the other. Thus, for this additional reason,

Applicants respectfully submit that Claims 1-5, 8, 10 and 13 are patentable over Yoneda in view of Niihara.

Section 103(a) Rejection of Claims 16, 18-19 and 23-25 Over Sunahara in view of Niihara

Claim 16 has been amended so that the first and third substrates have only one electrode disposed thereon. In addition, amended Claim 16 requires a second electrically insulative substrate to have electrodes disposed on first and second surfaces and extending to opposite ends of the substrate, respectively. First and second polymer PTC elements are positioned between the first and second substrates and the second and third substrates, respectively.

As a result of the electrode configuration on the substrates, the electrodes also have the following structural relationship with the first and second PTC elements: (i) the electrode disposed on the first substrate is also disposed on the first surface of the first PTC element and extends to the first end of the first PTC element but not the second end of the first PTC element; (ii) the first electrode disposed on the second end of the first PTC element but not the first end of the first PTC element; (iii) the second electrode disposed on the second substrate is also disposed on the first surface of the second PTC element and extends to the first end of the second PTC element but not the second end of the second PTC element; and (iv) the electrode disposed on the third substrate is also disposed on the second surface of the second PTC element and extends to the second end of the second PTC element but not the first end of the second PTC element.

Applicants respectfully submit that amended Claim 16 would not have been obvious to one of ordinary skill in the art based on the combination of Sunahara and Niihara. First, in Claim 16 of the present application the first and third substrates have only one electrode disposed thereon. On the other hand, Sunahara discloses a device with at least two electrodes (24, 30a) disposed on the first substrate (28a) and at least two electrodes (22, 30d) disposed on the third substrate (28e). Second, in Claim 16 of the present invention the first electrode disposed on the second substrate is also disposed on the first PTC element, but extends to one end of the first PTC element and not the other. Likewise, the second electrode disposed on the second substrate is also disposed on the second PTC element, but extends to one end of the second PTC element and not the other. Contrary to this claimed structure, Sunahara discloses a device wherein the electrodes (30b, 30c) disposed on the second substrate (28c) cover the entire corresponding surface of the contacting PTC element (e.g., electrodes 30a and 30b cover the entire top and

bottom surfaces of thermistor 12, and electrodes 30c and 30d cover the entire top and bottom surfaces of thermistor 14).

Claim 16 is not rendered obvious by the addition of Niihara to the teachings of Sunahara. Claim 16 requires PTC elements positioned between electrically insulating substrates having electrodes disposed thereon. Niihara, by contrast, does not employ electrically insulating substrates. Instead, Niihara discloses a device wherein the electrodes are embedded in a polymer PTC element. The PTC element is not electrically insulating. If it were, the device would not function as intended. Accordingly, for these reasons Applicants respectfully submit that Claim 16 is in condition for allowance.

Claims 18-19 and 23-25 depend, either directly or indirectly, from Claim 16 and necessarily include each limitation as Claim 16. Thus, for the same reasons Claim 16 is patentable over Sunahara in view of Niihara, Applicants submit that Claims 18-19 and 23-25 are also patentable.

Conclusion

Applicants have made an earnest endeavor to place this application in condition for allowance. In view of the above amendments and remarks, Applicants respectfully submit that this application is in condition for allowance and such action is respectfully requested.

The Examiner is invited to telephone the undersigned attorney, to expedite any further prosecution of this application. The Examiner is also authorized to charge any deficiencies or credit any overpayments associated with this communication to Deposit Account 02-1818.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Versions with Markings to Show Changes Made.**"

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. (Twice Amended) A surface-mountable electrical circuit protection device comprising:
a first electrically insulative supporting substrate having a first end and a second end and only one electrode disposed on a first surface thereof, the electrode ~~disposed on the first surface of the first supporting substrate extends to one of the first or second end of the first substrate but not the other of the first or second end of the first substrate extending to the first end of the first substrate but not the second end of the first substrate;~~
a second electrically insulative supporting substrate having a first end and a second end and only one electrode disposed on a first surface thereof, the electrode ~~disposed on the first surface of the second supporting substrate extends to one of the first or second end of the second substrate but not the other of the first or second end of the second substrate extending to the second end of the second substrate but not the first end of the second substrate;~~
a PTC element having a first end and a second end and a first surface and a second surface running therebetween, the PTC element comprised of a polymer having conductive particles dispersed therein, the PTC element positioned between the first and second supporting substrates and electrically connected to the electrodes;
the electrode disposed on the first surface of the first supporting substrate is also disposed on the first surface of the PTC element and is the only electrode disposed on the first surface of the PTC element, and extends to ~~one of the first or second end of the PTC element but not the other of the first or second end of the PTC element, the electrode disposed on the first surface of the second supporting substrate is also disposed on the second surface of the PTC element and is the only electrode disposed on the second surface of the PTC element, and~~ extends to ~~one of the first or second end of the PTC element but not the other of the first or second end of the PTC element;~~
a first electrically conductive end termination wrapping around the first end of the PTC element and electrically contacting the electrode disposed on the first substrate; and
a second electrically conductive end termination wrapping around the second end of the PTC element and electrically contacting the electrode disposed on the second substrate.

10. (Amended) The device of Claim 9 1, wherein the electrode disposed on the first surface of the first supporting substrate is in direct contact with one of the first or second electrically conductive end terminations but not the other of the first or second electrically conductive end terminations.

16. (Twice Amended) A surface-mountable electrical circuit protection device comprising:
a first electrically insulative substrate having ~~a first~~ only one electrode disposed thereon ~~on a first surface thereof~~;

a first PTC element comprised of a polymer with conductive particles dispersed therein and having a first end and a second end and a first surface and a second surface running therebetween;

a second electrically insulative substrate having a first end and a second end and a first electrode disposed on a first surface thereof and a second electrode disposed on a second surface thereof, the first electrode disposed on the first surface of the second substrate extends to ~~one of~~ the ~~first or~~ second end of the second substrate but not the ~~either of the~~ ~~first or second~~ end of the second substrate, the second electrode disposed on the second surface of the second substrate extends to ~~one of~~ the ~~first or second~~ end of the second substrate but not the ~~either of the~~ ~~first or~~ second end of the second substrate;

a second PTC element comprised of a polymer with conductive particles dispersed therein and having a first end and a second end and a first surface and a second surface running therebetween;

a third electrically insulative substrate having ~~a first~~ only one electrode disposed ~~on a first surface thereof~~ thereon;

the first PTC element positioned between the first and second supporting substrates such that: (i) the electrode disposed on the first substrate is also disposed on the first surface of the first PTC element and extends to the first end of the first PTC element but not the second end of the first PTC element; and (ii) the first electrode disposed on the second substrate is also disposed on the second surface of the first PTC element and extends to the second end of the first PTC element but not the first end of the first PTC element;

the second PTC element positioned between the second and third supporting substrates such that: (i) the second electrode disposed on the second substrate is also disposed on the first

surface of the second PTC element and extends to the first end of the second PTC element but not the second end of the second PTC element; and (ii) the electrode disposed on the third substrate is also disposed on the second surface of the second PTC element and extends to the second end of the second PTC element but not the first end of the second PTC element;

~~a first PTC element comprised of a polymer having conductive particles dispersed therein, the first PTC element interposed between the first and second substrates and electrically connecting the first electrode disposed on the first substrate with the first electrode disposed on the second substrate;~~

~~a second PTC element comprised of a polymer having conductive particles dispersed therein, the second PTC element interposed between the second and third substrates and electrically connecting the second electrode disposed on the second substrate with the first electrode disposed on the third substrate;~~

a first conductive end termination wrapping around a first end of the device; and

a second conductive end termination wrapping around a second end of the device.

18. (Amended) The electrical device of Claim 16 wherein the first, second and third substrates are formed from a material selected from the group ~~comprised~~ consisting of ceramic, FR-4 epoxy, glass, and melamine.